

In the Claims:

1 - 20. (Canceled)

21. (Currently Amended) A method for electro-optically inspecting and determining internal properties and characteristics of a longitudinally moving rod of material, comprising the steps of:

- (a) guiding the longitudinally moving rod of material along its longitudinal axis by a rod guiding unit, along an optical path within a transparent passageway, said optical path and said transparent passageway coaxially extend along said longitudinal axis of the moving rod of material and pass through an electro-optical transmission module;
- (b) generating a focused beam of electromagnetic radiation by an illumination unit of said electro-optical transmission module, such that said focused beam is transmitted through a first side of said transparent passageway and incident upon the rod of material longitudinally moving within said transparent passageway;
- (c) illuminating a volumetric segment of the longitudinally moving rod of material by said incident focused beam, such that at least part of said incident focused beam is affected by and transmitted through said volumetric segment and then transmitted through a second side of said transparent passageway, for forming a rod material volumetric segment transmitted beam; and
- (d) detecting said rod material volumetric segment transmitted beam by a detection unit of said electro-optical transmission module, for forming a detected rod material volumetric segment transmitted beam ~~useable for determining the internal properties and characteristics of the longitudinally moving rod of material;~~ and
- (e) processing and analyzing said focused beam of step (b), said incident focused beam of step (c), and said rod material detected volumetric segment transmitted beam of step (d), by a process control and data analysis unit, for determining the internal properties and characteristics of the longitudinally moving rod of material.

22. (Previously Presented) The method of claim 21, wherein said incident focused beam is of electromagnetic radiation selected from the group consisting of infrared radiation, visible light, and ultraviolet radiation.

23. (Previously Presented) The method of claim 21, wherein said incident focused beam is of infrared electromagnetic radiation having wavelength in a range of between about 900 nm and about 1000 nm.

24. (Previously Presented) The method of claim 21, wherein said incident focused beam is of infrared electromagnetic radiation having wavelength in a range of between about 920 nm and about 970 nm.

25. (Previously Presented) The method of claim 21, wherein step (b), said generating said focused beam of electromagnetic radiation by said illumination unit includes a procedure for monitoring temperature and compensating for temperature changes in at least one critical region of operation of said illumination unit.

26. (Previously Presented) The method of claim 25, wherein a said critical region of operation is in immediate vicinity of said illuminated volumetric segment of the rod of material longitudinally moving along said optical path within said transparent passageway during the electro-optical inspection process.

27. (Previously Presented) The method of claim 25, wherein a said critical region of operation is in immediate vicinity where said incident focused beam is transmitted through said first side of said transparent passageway and incident upon said volumetric segment.

28. (Previously Presented) The method of claim 25, wherein step (b), said operation of said illumination unit including said procedure for monitoring temperature and compensating for temperature changes is based on a temperature change monitoring and compensating electro-optical feedback loop.

29. (Previously Presented) The method of claim 21, wherein step (d), said detecting said rod material volumetric segment transmitted beam by said detection unit further includes a procedure for monitoring temperature and compensating for temperature changes in at least one critical region of operation of said detection unit.

30. (Previously Presented) The method of claim 29, wherein a said critical region of operation is in immediate vicinity of said illuminated volumetric segment of the rod of material longitudinally moving along said optical path within said transparent passageway.

31. (Previously Presented) The method of claim 29, wherein a said critical region of operation is in immediate vicinity where said rod material volumetric segment transmitted beam is transmitted from said volumetric segment and then transmitted through said second side of said transparent passageway, and then detected and received by said detection unit.

32. (Previously Presented) The method of claim 29, wherein step (d), operation of said detection unit including said procedure for monitoring temperature and compensating for temperature changes is based on a temperature change monitoring and compensating electro-optical detection circuit.

33. (Previously Presented) The method of claim 21, wherein the internal properties and characteristics are density, structure, defects, and impurities, and variabilities thereof, of the longitudinally moving rod of material.

34. (Previously Presented) The method of claim 21, wherein said electro-optical transmission module includes a module housing through which passes said transparent passageway within which is said guided longitudinally moving rod of material.

35. The method of claim 34, further including a procedure for monitoring temperature and compensating for temperature changes in at least one critical region of operation of said module housing.

36. (Previously Presented) The method of claim 21, further including a procedure for preventing, eliminating, or reducing, radially directed vibrating of the longitudinally moving rod of material during electro-optically inspecting the longitudinally moving rod of material.

37. (Previously Presented) The method of claim 36, wherein said procedure includes generating a continuous vortical type of flow of gas within and along said transparent passageway by a vortex generating mechanism.

38. (Previously Presented) The method of claim 36, wherein said procedure includes generating a continuous vortical type of flow of gas within and along said transparent passageway by a vortex generating mechanism, such that said flowing gas rotates as a vortex around said optical path and around the longitudinally moving rod of material, and flows downstream within and along said transparent passageway in same longitudinal direction of the longitudinally moving rod of material, such that said flowing gas radially impinges upon the longitudinally moving rod of material within said transparent passageway, whereby said flowing gas radially impinging upon the longitudinally moving rod of material prevents, eliminates, or reduces, radially directed vibrating of the longitudinally moving rod of material during the electro-optically inspecting the longitudinally moving rod of material.

39. (Previously Presented) The method of claim 37, wherein pressure, and linear flow velocity, of said flow of gas are about one atmosphere above room atmospheric pressure, and about 100 meters per minute, respectively.

40. (Previously Presented) The method of claim 37, wherein operation of said vortex generating mechanism also cleans said rod guiding unit and cleans said transparent passageway during the electro-optical inspection process.

41. (Previously Presented) The method of claim 21, further including a procedure for cleaning said rod guiding unit and cleaning said transparent passageway during the electro-optical inspection process.

42. (Previously Presented) The method of claim 41, wherein said procedure includes generating a continuous vortical type of flow of gas within and along said transparent passageway by a vortex generating mechanism, whereby said flow of gas cleans said rod guiding unit and cleans said transparent passageway during the electro-optical inspection process.

43. (Previously Presented) The method of claim 21, wherein the longitudinally moving rod of material is a longitudinally moving cigarette rod.

44. (Previously Presented) The method of claim 21, wherein the longitudinally moving rod of material is a longitudinally moving cigarette rod consisting of processed tobacco inside a rolled and sealed tube of cigarette wrapping paper.

45. (Previously Presented) The method of claim 21, wherein step (a), said optical path and said transparent passageway coaxially extend along said longitudinal axis of the moving rod of material and pass through a plurality of more than one said electro-optical transmission module.

46. (Previously Presented) The method of claim 45, wherein each of said plurality of said electro-optical transmission modules is positionable at a different longitudinal position or location around and along said transparent passageway within which extends said optical path.

47. (Previously Presented) The method of claim 45, wherein each of said plurality of said electro-optical transmission modules is positionable at a same or different angular, radial, or circumferential, position or location around said transparent passageway within which extends said optical path.

48. (Previously Presented) The method of claim 45, wherein longitudinal and angular or circumferential positions of said plurality of said electro-optical transmission modules, relative to each other, and relative to said transparent passageway within which extends said optical path, are spatially staggered or displaced along said optical path, along which the longitudinally moving rod of material is guided by said rod guiding unit.

49. (Previously Presented) The method of claim 45, wherein each said electro-optical transmission module through which pass said optical path and said transparent passageway includes a paired said illumination unit and said detection unit.

50. (Previously Presented) The method of claim 49, wherein said paired illumination and detection units of said plurality of said electro-optical transmission modules are temporally continuously or discontinuously activated according to a pre-determined timing or switching schedule or sequence, while the longitudinally moving rod of material is continuously or intermittently moving and being guided through said plurality of electro-optical transmission modules.

51. (Previously Presented) The method of claim 50, wherein said pre-determined timing or switching schedule or sequence is effected via applying a synchronous or asynchronous on/off switching schedule or sequence for operating said paired illumination and detection units.

52. (Previously Presented) A method for preventing, eliminating, or reducing, radially directed vibrating of a longitudinally moving rod of material during electro-optically inspecting the longitudinally moving rod of material, comprising the steps of:

- (a) guiding the longitudinally moving rod of material along its longitudinal axis by a rod guiding unit, along an optical path within a transparent passageway, said optical path and said transparent passageway coaxially extend along said longitudinal axis of the longitudinally moving rod of material and pass through an electro-optical inspection apparatus used for electro-optically inspecting the longitudinally moving rod of material; and
- (b) generating a continuous vortical type of flow of gas within and along said transparent passageway by a vortex generating mechanism, such that said flowing gas rotates as a vortex around said optical path and around the longitudinally moving rod of material, and flows downstream within and along said transparent passageway in same longitudinal direction of the longitudinally moving rod of material, such that said flowing gas radially

impinges upon the longitudinally moving rod of material within said transparent passageway;

whereby said flowing gas radially impinging upon the longitudinally moving rod of material prevents, eliminates, or reduces, radially directed vibrating of the longitudinally moving rod of material during the electro-optically inspecting the longitudinally moving rod of material.

53. (Previously Presented) The method of claim 52, wherein pressure, and linear flow velocity, of said flow of gas are about one atmosphere above room atmospheric pressure, and about 100 meters per minute, respectively.

54. (Previously Presented) A device for electro-optically inspecting and determining internal properties and characteristics of a longitudinally moving rod of material, comprising:

- (a) a rod guiding unit for guiding the longitudinally moving rod of material along its longitudinal axis, along an optical path within a transparent passageway, said optical path and said transparent passageway coaxially extend along said longitudinal axis of the moving rod of material; and
- (b) an electro-optical transmission module through which pass said optical path and said transparent passageway, said electro-optical transmission module includes:
 - (i) an illumination unit for generating a focused beam of electromagnetic radiation, such that said focused beam is transmitted through a first side of said transparent passageway and incident upon the rod of material longitudinally moving within said transparent passageway, said incident focused beam illuminates a volumetric segment of the longitudinally moving rod of material, such that at least part of said incident focused beam is transmitted through said volumetric segment and through a second side of said transparent passageway, for forming a rod material volumetric segment transmitted beam; and
 - (ii) a detection unit for detecting said rod material volumetric segment transmitted beam, for forming a detected rod

material volumetric segment transmitted beam useable for determining the internal properties and characteristics of the longitudinally moving rod of material.

55. (Previously Presented) The device of claim 54, wherein said rod guiding unit includes a transparent housing, for housing, holding, or confining, said transparent passageway within which is said optical path, along which is guided the longitudinally moving rod of material.

56. (Previously Presented) The device of claim 55, wherein said transparent housing is of a hollow tubular or cylindrical geometrical shape, and is constructed from an optically transparent material.

57. (Previously Presented) The device of claim 54, wherein said illumination unit includes an electromagnetic radiation beam source, said electromagnetic radiation beam source is of structure and functions according to either light emitting diode technology, or fiber optic technology.

58. (Previously Presented) The device of claim 54, wherein said incident focused beam is of electromagnetic radiation selected from the group consisting of infrared radiation, visible light, and ultraviolet radiation.

59. (Previously Presented) The device of claim 54, wherein said incident focused beam is of infrared electromagnetic radiation having wavelength in a range of between about 900 nm and about 1000 nm.

60. (Previously Presented) The device of claim 54, wherein said incident focused beam is of infrared electromagnetic radiation having wavelength in a range of between about 920 nm and about 970 nm.

61. (Previously Presented) The device of claim 54, wherein said illumination unit includes components and is operated by a procedure for monitoring temperature and compensating for temperature changes in at least one critical region of operation of said illumination unit.

62. (Previously Presented) The device of claim 61, wherein said components of said illumination unit for said monitoring temperature and said compensating for said temperature changes include: a polarizing beam splitter, an optical feedback reference beam detector, an optical feedback reference beam signal amplifier, an illumination unit temperature sensor, an illumination unit temperature sensor signal amplifier, an illumination unit signal comparator, a proportional integrated regulator, a current regulator, and illumination unit electro-optical feedback loop component connections and linkages.

63. (Previously Presented) The device of claim 61, wherein a said critical region of operation is in immediate vicinity of said illuminated volumetric segment of the rod of material longitudinally moving along said optical path within said transparent passageway during the electro-optical inspection process.

64. (Previously Presented) The device of claim 61, wherein a said critical region of operation is in immediate vicinity where said incident focused beam is transmitted through said first side of said transparent passageway and incident upon said volumetric segment.

65. (Previously Presented) The device of claim 61, wherein said operation of said illumination unit including said components and said procedure for monitoring temperature and compensating for temperature changes is based on a temperature change monitoring and compensating electro-optical feedback loop.

66. (Previously Presented) The device of claim 54, wherein said detection unit includes at least one transmitted beam detector, each said transmitted beam detector is of structure and functions as a light receiving type of device selected from the group consisting of a phototransistor, a photosensitive transducer, a fiber optic conductor or guide, and a photoelectric element.

67. (Previously Presented) The device of claim 54, wherein said detection unit includes components and is operated by a procedure for monitoring

temperature and compensating for temperature changes in at least one critical region of operation of said detection unit.

68. (Previously Presented) The device of claim 67, wherein said components of said detection unit for said monitoring temperature and said compensating for said temperature changes include: a detection unit temperature sensor, a detection unit temperature sensor signal amplifier, and a detection unit signal comparator.

69. (Previously Presented) The device of claim 67, wherein a said critical region of operation is in immediate vicinity of said illuminated volumetric segment of the rod of material longitudinally moving along said optical path within said transparent passageway.

70. (Previously Presented) The device of claim 67, wherein a said critical region of operation is in immediate vicinity where said rod material volumetric segment transmitted beam is transmitted from said volumetric segment and then transmitted through said second side of said transparent passageway, and then detected and received by said detection unit.

71. (Previously Presented) The device of claim 67, wherein said operation of said detection unit including said components and said procedure for monitoring temperature and compensating for temperature changes is based on a temperature change monitoring and compensating electro-optical detection circuit.

72. (Previously Presented) The device of claim 54, wherein the internal properties and characteristics are density, structure, defects, and impurities, and variabilities thereof, of the longitudinally moving rod of material.

73. (Previously Presented) The device of claim 54, wherein said electro-optical transmission module includes a module housing through which passes said transparent passageway within which is said guided longitudinally moving rod of material.

74. (Previously Presented) The device of claim 73, wherein said module housing includes components and is operated by a procedure for monitoring temperature

and compensating for temperature changes in at least one critical region of operation of said module housing.

75. (Previously Presented) The device of claim 74, wherein said components of said module housing for said monitoring temperature and said compensating for said temperature changes include: a module housing temperature sensor, and associated electro-optical circuitry.

76. (Previously Presented) The device of claim 54, further including components for preventing, eliminating, or reducing, radially directed vibrating of the longitudinally moving rod of material during electro-optically inspecting the longitudinally moving rod of material.

77. (Previously Presented) The device of claim 76, wherein said components include: a vortex generating mechanism, for generating a continuous vortical type of flow of gas within and along said transparent passageway.

78. (Previously Presented) The device of claim 76, wherein said components include: a vortex generating mechanism, for generating a continuous vortical type of flow of gas within and along said transparent passageway, such that said flowing gas rotates as a vortex around said optical path and around the longitudinally moving rod of material, and flows downstream within and along said transparent passageway in same longitudinal direction of the longitudinally moving rod of material, such that said flowing gas radially impinges upon the longitudinally moving rod of material within said transparent passageway, whereby said flowing gas radially impinging upon the longitudinally moving rod of material prevents, eliminates, or reduces, radially directed vibrating of the longitudinally moving rod of material during the electro-optically inspecting the longitudinally moving rod of material.

79. (Previously Presented) The device of claim 77, wherein pressure, and linear flow velocity, of said flow of gas are about one atmosphere above room atmospheric pressure, and about 100 meters per minute, respectively.

80. (Previously Presented) The device of claim 77, wherein operation of said vortex generating mechanism also cleans said rod guiding unit and cleans said transparent passageway during the electro-optical inspection process.

81. (Previously Presented) The device of claim 54, further including components for cleaning said rod guiding unit and cleaning said transparent passageway during the electro-optical inspection process.

82. (Previously Presented) The device of claim 81, wherein said components include: a vortex generating mechanism, for generating a continuous vortical type of flow of gas within and along said transparent passageway, whereby said flow of gas cleans said rod guiding unit and cleans said transparent passageway during the electro-optical inspection process.

83. (Previously Presented) The device of claim 54, wherein the longitudinally moving rod of material is a longitudinally moving cigarette rod.

84. (Previously Presented) The device of claim 54, wherein the longitudinally moving rod of material is a longitudinally moving cigarette rod consisting of processed tobacco inside a rolled and sealed tube of cigarette wrapping paper.

85. (Previously Presented) The device of claim 54, wherein said optical path and said transparent passageway coaxially extend along said longitudinal axis of the moving rod of material and pass through a plurality of more than one said electro-optical transmission module.

86. (Previously Presented) The device of claim 85, wherein each of said plurality of said electro-optical transmission modules is positionable at a different longitudinal position or location around and along said transparent passageway within which extends said optical path.

87. (Previously Presented) The device of claim 85, wherein each of said plurality of said electro-optical transmission modules is positionable at a same or different

angular, radial, or circumferential, position or location around said transparent passageway within which extends said optical path.

88. (Previously Presented) The device of claim 85, wherein longitudinal and angular or circumferential positions of said plurality of said electro-optical transmission modules, relative to each other, and relative to said transparent passageway within which extends said optical path, are spatially staggered or displaced along said optical path, along which the longitudinally moving rod of material is guided by said rod guiding unit.

89. (Previously Presented) The device of claim 85, wherein each said electro-optical transmission module through which pass said optical path and said transparent passageway includes a paired said illumination unit and said detection unit.

90. (Previously Presented) The device of claim 89, wherein said paired illumination and detection units of said plurality of said electro-optical transmission modules are temporally continuously or discontinuously activated according to a pre-determined timing or switching schedule or sequence, while the longitudinally moving rod of material is continuously or intermittently moving and being guided through said plurality of electro-optical transmission modules.

91. (Previously Presented) The device of claim 90, wherein said pre-determined timing or switching schedule or sequence is effected via applying a synchronous or asynchronous on/off switching schedule or sequence for operating said paired illumination and detection units.

92. (Previously Presented) A device for preventing, eliminating, or reducing, radially directed vibrating of a longitudinally moving rod of material during electro-optically inspecting the longitudinally moving rod of material, comprising: a rod guiding unit for guiding the longitudinally moving rod of material along its longitudinal axis, along an optical path within a transparent passageway, said optical path and said transparent passageway coaxially extend along said longitudinal axis of the longitudinally moving rod of material and pass through an electro-optical inspection apparatus used for electro-optically inspecting the longitudinally moving rod of material, said rod guiding unit

includes a vortex generating mechanism for generating a continuous vortical type of flow of gas within and along said transparent passageway, such that said flowing gas rotates as a vortex around said optical path and around the longitudinally moving rod of material, and flows downstream within and along said transparent passageway in same longitudinal direction of the longitudinally moving rod of material, such that said flowing gas radially impinges upon the longitudinally moving rod of material within said transparent passageway, whereby said flowing gas impinging upon the longitudinally moving rod of material prevents, eliminates, or reduces, radially directed vibrating of the longitudinally moving rod of material, during the electro-optically inspecting the longitudinally moving rod of material.

93. (Previously Presented) The device of claim 92, wherein pressure, and linear flow velocity, of said flow of gas are about one atmosphere above room atmospheric pressure, and about 100 meters per minute, respectively.